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has altered our notions concerning the prevailing deep-rootedness of desert plants. In a recent short paper he brings further data along similar lines. The mesquite, as is well known, either may be a shrub or it may be a tree of considerable size. On flood plains, where it is a tree, its roots penetrate to the water table, whose depth may be 15–25 feet. Shrubby specimens on higher grounds have extensively spreading rather than deep roots. CANNON considers the root situation in different types of climate and makes several interesting suggestions.

In a brief note[39] CANNON calls attention to the somewhat curious fact that at Carmel, California, the removal of the chaparral undergrowth in forests of *Pinus radiata* is followed by the death of the pines. This is attributed to the shallow root system of the pines, which comes to grief when the soil is desiccated as a result of the removal of the chaparral.—H. C. COWLES.

Sand hill forestation.—Some government experiments of considerable interest to ecologists are being conducted in the sand hills of Kansas and Nebraska, as noted by BATES and PIERCE.[40] While the sand hills of Kansas are not extensive, almost a fourth of Nebraska is thus classified. Trees and even shrubs are not naturally very abundant in the sand hill region except along streams. In the planting a cue is taken from nature in the presence of *Pinus ponderosa* in the sand hill region; the occurrence of isolated tracts of this species suggests a former more extensive distribution. At the suggestion of Professor BESSEY, the Forest Service began planting as far back as 1891. About ten years ago, large tracts of land capable of forestation were set aside as national forests, and nurseries were established at Halsey, Nebraska, and Garden City, Kansas. In the Nebraska nursery, attention has been paid to conifers, and success has been had especially with *Pinus Banksiana* and the native *P. ponderosa*. In the Kansas nursery, experiment has been made chiefly with hardwoods.—H. C. COWLES.

The chemistry of symbiosis.—Not much is known concerning the exact chemical interrelations of symbionts. To ZELLNER it is a matter of surprise that investigators of symbiosis have paid so little attention to this fundamentally important feature, and he indicates in a brief paper[41] some of the places where more knowledge is urgently needed. Best known, of course, are the chemical interrelations existing between bacteria and Leguminosae. The significance of mycorhiza is much in dispute; ZELLNER'S view is that the fungi are water-absorbing organs for the roots. In the endotrophic forms phagocytosis is an important feature that should be looked into. As to lichens, it is noted that the chemistry of the plant complex is very different from the chemistry of the sum of the components, grown as separate individuals; the nutritive relations of the algal symbionts are not known. Similar suggestions are made relative to the need of investigating the chemistry of parasitism, as illustrated by ergot, wheat rust, and their host plants.—H. C. COWLES.

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[39] CANNON, W. A., A note on a chaparral-forest relation at Carmel, California. Plant World **16**:36–38. 1913.

[40] BATES, C. G., and PIERCE, R. G., Forestation of the sand hills of Nebraska and Kansas. Bull. 121, U.S. Forest Service. pp. 49. *pls. 13. fig. 1.* 1913.

[41] ZELLNER, JULIUS, Die Symbiose der Pflanzen als chemisches Problem. Beih. Bot. Centralbl. **28**^{1}: 473–486. 1912.

Lichens in relation to their substratum.—BACHMANN,[42] who for many years has paid attention to the substratum relations of lichens, has reported his observations on the lichens of granite and quartz. Granite is decomposed into a claylike substance by lichen tissue with some rapidity, the micaceous constituents being particularly subject to ready decay. The quartz elements, on the other hand, are extremely resistant to such decomposition.

In a later paper BACHMANN[43] reports the results of studies on calcareous lichens with *Chroolepus* gonidia. He finds that the *Chroolepus* itself is able to dissolve calcium carbonate, so that after a time a limestone becomes perforated in spongelike fashion through the agency of the *Chroolepus* cells of the fungal hyphae. As soon as the *Chroolepus* cells become inclosed by hyphae, they bud in a yeastlike manner and take on bizarre forms. On account of its position within a rock, such a lichen retains moisture longer than do ordinary superficial lichens.—H. C. COWLES.

Taxonomic notes.—WERNHAM[44] has described a new genus (*Neosabicea*) of Rubiaceae from Colombia. It belongs to the tribe Mussaendeae.

DÜMMER[45] has described two new species of *Callitris*, one from New Caledonia and the other from the mountains of Ngoye.

BENEDICT[46] has begun a revision of the genus *Vittaria*. The first paper is a discussion of seven species, representing the subgenus *Radiovittaria*, and includes two new species.

BAKER[47] has published a study of the African species of *Crotalaria*, preceding the descriptive list by a historical introduction, and also a discussion of the delimitation of the genus. The paper recognizes 309 species, the genus extending from Egypt and the Soudan and the Sahara to Cape Colony in the

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[42] BACHMANN, E., Die Beziehungen der Kieselflechten zu ihrer Unterlage. II. Granat und Quarz. Ber. Deutsch. Bot. Gesells. **29**:261–273. *figs. 4.* 1911.

[43] ———, Der Thallus der Kalkflechten. II. Flechten mit Chroolepugonidien. Ber. Deutsch. Bot. Gesells. **31**:3–12. *pl. 1.* 1913.

[44] WERNHAM, H. F., New Rubiaceae from tropical America. Jour. Botany **52**: 225–277. *pl. 533.* 1914.

[45] DÜMMER, R. A., Three Conifers. Jour. Botany **52**:236–241. 1914.

[46] BENEDICT, R. C., A revision of the genus *Vittaria* J. E. Smith. Bull. Torr. Bot. Club **41**:391–410. *figs. 7. pls. 15–20.* 1914.

[47] BAKER, E. G., The African species of *Crotalaria*. Linn. Soc. London. Bot. **42**:241–425. *pls. 9–14.* 1914.